

CLAIMS

What is claimed is:

- 1 1. A method of assembling a structure onto a substrate, said method comprising:
 - 2 dispensing a slurry onto said substrate, said slurry comprising a fluid and a
 - 3 first plurality of elements, each of which is designed to mate with a
 - 4 receptor region on said substrate and each of which comprises a
 - 5 functional element;
- 6 wherein said slurry further comprises a second plurality of elements which are
- 7 not designed to mate with a receptor region on said substrate.
- 1 2. A method as in claim 1 wherein said second plurality of elements facilitate
- 2 movement of said first plurality of elements over said substrate and do not include any
- 3 functional elements.
- 1 3. A method as in claim 1 wherein said second plurality of elements is added to
- 2 said slurry after said slurry is dispensed onto said substrate.
- 1 4. A method as in claim 1 wherein said second plurality of elements is added to
- 2 said slurry before said slurry is dispensed onto said substrate.
- 1 5. A method as in claim 1 wherein each of said second plurality of elements is
- 2 larger in at least one dimension than each of said first plurality of elements.

1 6. A method as in claim 5 wherein each of said second plurality of elements is
2 significantly larger in said one dimension than each of said first plurality of elements.

1 7. A method as in claim 6 wherein each of said second plurality of elements is at
2 least ten times larger in said one dimension.

1 8. A method as in claim 2 wherein said second plurality of elements facilitate said
2 movement by physically pushing said first plurality of elements on said substrate.

1 9. A method as in claim 8 wherein each of said second plurality of elements has
2 at least one dimension which is larger than a receptor dimension of said receptor
3 region.

1 10. A method as in claim 9 wherein each of said second plurality of elements has a
2 shape selected from the group consisting of: (a) a sphere; (b) a cylinder; (c) a
3 polygonal solid and wherein each of said second plurality of elements comprises
4 magnetic material.

1 11. A method as in claim 9 wherein each of said second plurality of elements has a
2 shape which is substantially similar to a shape of each of said first plurality of
3 elements.

1 12. A method as in claim 1 further comprising exposing a surface of each of said
2 second plurality of elements to a first solvent prior to adding said second plurality of
3 elements to said fluid to create said slurry, wherein said exposing decreases friction
4 between said surface and said substrate.

1 13. A method as in claim 12 wherein each of said second plurality of elements is
2 significantly larger in at least one dimension than each of said first plurality of
3 elements.

1 14. A method of assembling a structure onto a substrate, said method comprising:
2 dispensing in a flow having a first direction a slurry onto said substrate, said
3 slurry comprising a fluid and a first plurality of elements, each of
4 which is designed to mate with a receptor region on said substrate and
5 each of which comprises a functional element;
6 vibrating said substrate in a second direction which is substantially
7 perpendicular to said first direction.

1 15. A method as in claim 14 wherein said vibrating occurs while said first plurality
2 of elements are mating with receptor regions on said substrate.

1 16. A method as in claim 15 wherein said first plurality of elements are dispensed
2 on said substrate and move along said substrate as said substrate is vibrated.

- 1 17. A method as in claim 14 wherein said substrate is tilted at angle from
- 2 horizontal and wherein said first plurality of elements slide down said substrate by
- 3 gravity.

- 1 18. A method as in claim 17 where in said angle is not greater than 55°.

- 1 19. A method as in claim 15 wherein said vibrating is at a frequency ranging from
- 2 about 50 Hz to 10,000 Hz.

- 1 20. A method as in claim 19 wherein said vibrating has a waveform of the form of
- 2 one of: a square wave; a sine wave; or a sawtooth wave.

- 1 21. A method as in claim 17 wherein said second direction of said vibrating is
- 2 substantially transverse to a direction of sliding of said first plurality of elements down
- 3 said substrate.

- 1 22. A method as in claim 14 wherein a direction of said vibrating is substantially
- 2 normal to a surface of said substrate which includes said receptor regions.

- 1 23. A method as in claim 16 wherein said functional element comprises at least one
- 2 electrical element.

- 1 24. A method as in claim 15 further comprising:

2 including in said slurry a second plurality of elements which are not designed
3 to mate with receptor regions on said substrate.

1 25. A method as in claim 24 wherein said second plurality of elements facilitate
2 movement of said first plurality of elements over said substrate.

1 26. A method as in claim 25 wherein each of said second plurality of elements is
2 significantly larger than each of said first plurality of elements.

1 27. A method as in claim 15 further comprising:
2 exposing a surface each of said first plurality of elements to a first solvent
3 prior to adding said first plurality of elements to said fluid to create said
4 slurry, wherein said exposing decreases friction between said surface
5 and said substrate.

1 28. A method as in claim 27 further comprising:
2 including in said slurry a second plurality of elements which are not designed
3 to mate with receptor regions on said substrate, wherein said second
4 plurality of elements facilitate movement of said first plurality of
5 elements over said substrate.

1 29. A method of assembling a structure onto a substrate, said method comprising:

2 creating a slurry comprising a fluid and a plurality of elements, each of which
3 is designed to mate with a receptor region on said substrate and each of
4 which comprises a functional element;
5 projecting said slurry through a nozzle toward said substrate.

1 30. A method of assembling a structure onto a substrate, said method comprising:
2 dispensing a slurry comprising a first fluid and a plurality of elements, each of
3 which is designed to mate with a receptor region on said substrate and
4 each of which comprises a functional element;
5 projecting a second fluid through a nozzle toward said substrate.

1 31. A method as in claim 30 wherein said first fluid and said second fluid
2 comprise the same solvent.

1 32. A method as in claim 30 wherein at least one of said first fluid and said second
2 fluid comprise at least one of a bonding agent and a surfactant.

1 33. A method as in claim 30 wherein said second fluid is projected toward said
2 substrate while said plurality of elements mates with receptor regions.

1 34. A method as in claim 30 further comprising:

2 pushing an excess of said plurality of elements off said substrate after said
3 plurality of elements have had an opportunity to mate with said
4 receptor regions.

1 35. A method as in claim 34 wherein said pushing comprises one of (1) wiping a
2 surface of said substrate or (2) dispensing a plurality of significantly larger elements
3 which are each significantly larger than each of said plurality of elements.

1 36. A method of assembling a structure onto a substrate, said method comprising:
2 dissolving a bonding agent into a solvent to create a fluid;
3 dispensing a slurry onto said substrate, said slurry comprising said fluid and a
4 plurality of elements each of which is designed to mate with a receptor
5 region on said substrate and each of which comprises a functional
6 element;
7 evaporating said solvent after each of said plurality of elements has mated with
8 a corresponding receptor, wherein said bonding agent bonds each of
9 said plurality of elements to said corresponding receptor.

1 37. A method for assembling a structure onto a substrate, said method comprising:
2 dispensing a slurry substantially uniformly over an entire surface of said
3 substrate, said entire surface comprising a plurality of receptor regions,
4 said slurry comprising a fluid and a first plurality of elements each of

5 which is designed to mate with a corresponding one of said plurality of
6 openings and each of which comprises a functional element.